

Human–wildlife interactions and management of invasive alien species*

Human–wildlife interactions turning into conflict and invasions of exotic flora and fauna are considered as the two biggest threats to wildlife conservation globally. In India, about 400 people are killed annually by elephants, many by carnivores, thousands of livestock are killed by big cats and hectares of agriculture areas are damaged by herbivores. Annually huge funds are allocated for preventing the entry of wild animals into the villages around protected areas (PA) and for compensation of conflicts. Simultaneously, biological invasions in the recent years have emerged as one of the major threats to the environment and has resulted in the loss of valuable ecosystem services. These problems are severe in developing countries such as India where most of the rural population depends on forests for their sustenance. Furthermore, increasing human population exerts pressure on the natural ecosystems, thereby increasing the frequency of these threats in future.

Frequently many studies have established invasive plants as one of the reasons for increasing negative human–wildlife interactions in India and adjoining countries. For example, decreased native food plants cover of Rhino¹ and reduced habitat use of elephant in Mudumalai Tiger Reserve have been attributed to invasive alien species².

The objective of this workshop was to bring together scientists, managers, field experts, policy makers, and representative of leading NGOs dealing with these issues for a better knowledge about the current state of the problems and to find a way forward. The workshop was conducted under the five major themes: (1) human–carnivore interactions, (2) human–herbivore interactions, (3) human–macaque interactions, (4) invasive alien species management and (5) law and

policy aspects for management of these problems. On the first day of the workshop, experts introduced the areas of concerns under different themes to all the participants followed by a focused discussions within working groups consisted of experts and researchers.

Ex-gratia, an important yet somewhat controversial tool of conflict management, was discussed exhaustively during the workshop. Group brainstormed on two important issues of (1) inequality in *ex-gratia* money across various states and (2) lack of quantification of ‘lost opportunity cost’ (opportunity to earn from the predated livestock in the years to come had it not been killed). According to the group, compensation can be strengthened by addressing these two limitations. Research findings of Y. V. Jhala and Kausik Banerjee (WII) also support the economic compensation that could minimize the negative attitude of local communities towards wildlife damage. For further strengthening the compensation, Ruchi Badola (WII) suggested on incorporating the social compensation in addition to economic one. S. S. Bist (WII) elaborated on the alternatives of economic compensation through subsidies for growing alternative crops, insurance for life and property, support for setting up wildlife-proof barriers, categorizing wildlife-depredation as ‘natural calamity’ and compensation by district administration.

Translocation of problem animal was also discussed in detail among the group members. Available standard operating procedures (SOP) recommend translocation of the rescued animal to a suitable habitat, however the assessment of the selected habitat is rarely done. Vidya Athreya (Wildlife Conservation Society) shared her findings wherein the translocation of leopard led to increased attack on humans in Maharashtra. Potential factors responsible for the increased conflict according to Athreya were the stress during the translocation process, homing instinct of the individual and loss of human fear during captivity. Qamar Qureshi (WII) also pointed out the drawbacks of translocation in terms of mortality of the concerned individual/population and/or transfer of the problem to other areas.

Experts also raised concern about the fate of wild animals in human-dominated landscapes. Population of mega carnivores and herbivores are connected through corridors which usually pass through a mosaic of anthropogenic land-uses. These corridors usually have low prey base and degraded habitats, thus making conflicts inevitable. With increasing landscape modification, chances of encountering these animals by humans as well as the negative interactions would increase. Hence, Dipankar Ghose (WWF) and Athreya highlighted the need to modify existing PA-centric approach of wildlife conservation to a landscape level conservation approach.

Overabundance of few species intensifies the negative interactions with humans. The reason for increase in population are species-specific. For example, changing land use pattern and increased resource availability post-green revolution period are considered as the causes for increasing population size of Nilgai, Wild Ass and Blackbuck. However, in the case of non-human primates conflict is increasing due to improper solid-waste management and religious attachments of human with the species. Population control of such species in high conflict areas is seen as a last resort for managing the negative human–wildlife interactions. However, experts cautioned to ascertain the population status of the species in question to avoid its local extirpation. Further, Bist added that population control of overabundant conflict animals become difficult if they belong to the Schedule I of Wildlife (Protection) Act, 1972.

A number of traditional and short-term mitigation measures to keep the animal away from the human habitations and crop lands were also discussed. It was realized that traditional preventive measures such as night vigil, noise (beating drums, fire crackers) and barriers (electric fencing, concrete walls, chili fencing and beehive near crop lands) could help in considerable reduction in damages due to wild animals.

Inventory and prioritization of invasive alien species (IAS) in various ecosystems based on research evidence was identified as the first step for their

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management. It was deliberated that efforts should be invested to identify IAS in major ecosystems such as terrestrial, marine, island and fresh water. A tentative list of invasive alien species of national concern in major ecosystems was developed by the group. According to the working group, MoEFCC in the context of national bio-security should direct agencies and concerned ministries to brainstorm over the issue of biological invasions as it is one of the 20 Aichi Biodiversity targets. The group also suggested establishment of task force for managing invasion in every ecosystem. Qureshi expressed his concerns for using bio-control agents without controlled trials as it could result in additional introduction of alien species. He also suggested taking precautionary measures during restoration activities to prevent invasion of weedy and exotic species in PAs. Experts also agreed on completely stopping the fire treatment of invasive plants in PAs, as it could harm native species and add to the carbon emission. Further, everyone agreed upon revising Plant Quarantine (Regulation of Import into India) Order, 2003 to incorporate restriction on transfer of biological agents from foreign as well as distinct biogeographic landscape of the country. A

need to minimize pesticide usage in managing invasive plants in protected areas was also discussed.

Considering the increasing conflict cases due to non-human primates, workshop had a dedicated session for human-macaque interactions. Group members recommended that population estimation should be the first step in resolving this issue and should be carried out in all the potential habitats (urban, semi-urban, rural, forest). Himachal Pradesh Forest Department (HPFD) has already taken a lead to solve the problem by adopting population control for managing the overabundant macaques. Satpal Dhiman (HPFD) provided a detailed account of the sterilization technique used by the department as well as associated key aspects. High cost-involvement in establishing sterilization centers, decline in capture rate of macaque at subsequent efforts and post-release monitoring are some major limitations of the existing strategy. For developing SOP for management, all the transitional steps such as capture, transportation and post monitoring of sterilized animal, etc. were discussed.

Group members strongly felt an immediate need to adopt an interdisciplinary approach for managing human-wildlife

interactions and invasive alien species. According to the group, all concerned stakeholders (e.g. horticulture, animal husbandry, forest department, police, veterinarians, social scientist, media persons and local communities) should be involved at every stage of management. Sensitization of local communities about the ecosystem services provided by the wildlife was identified as a tool for changing their perception towards wildlife. In the concluding session all the participants agreed on formulating guidelines for managing the negative interactions and high concern IAS. It was agreed that the conflict mitigation guidelines and SOPs should be species and site-specific to account for the immense economic, social and cultural diversity of our country.

1. Amin, R., Thomas, K., Emslie, R. H., Foose, T. J. and Strien, N., *Int. Zoo Yearb.*, 2006, **40**, 96–117.
2. Wilson, G., Desai, A. A., Sim, D. A. and Linklater, W. L., *J. Trop. Ecol.*, 2013, **29**, 199–207.

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